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ABSTRACT

Questions investigated in this study deal with relationships between map problem difficulty and students' acquired level of intellectual development, the effects of sequential mastery of map concepts, and the optimum age to introduce certain map concepts in the geography curriculum. In the main investigation, which covered varied selected, representative schools in the London, Nottingham, and Gloucester areas, boys and girls ages 8 to 15 years were tested in two groups. Group A were given the "shorter test" comprised of six scale questions and six composite questions, and B were given the "full test" comprised of composite questions on each of several maps. Among the suggestive results are: 1) eight year olds can understand conventional signs and direction questions; 2) the visualizing of relief from contour lines, the use of grid reference systems, and teaching of the location of individual buildings can be introduced at the age of about nine or ten; 3) more difficult problems such as understanding of scale, require the pupil to be 11 plus. Students need to be fourteen or older to interpret physical features and to discuss settlement problems. (SJM)

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INTERNATION GEOGRAPHICAL UNION

COMMISSION ON THE TEACHING OF GEOGRAPHY

An investigation into the optimum age at which different types of map questions may best be set to pupils in the teaching of Geography.

by :-

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P R E A M B L E

During the second full meeting of the Commission held in Paris on May 27th-28th, 1958, it was revealed, as a result of the first stage of the Commission's work, that in few countries have sound psychological studies been undertaken on the adaptation of the Geography curriculum to the pupil's mental development and capacity. If Geography is not taught according to proper psychological criteria, it cannot bring the most fruitful results. Some preliminary studies of this kind have been published in Britain in earlier years of which the following are examples :- E. David "Children's Maps: An Experiment", Geography (XXV) 1940; Report by the Training College Group Committee, "An investigation into Children's Ability to Interpret Contour Lines", Geography (XXVI), 1941; E. David, "The Teaching of Contours", Geography (XXIX), 1944. Nevertheless it was felt that further research should be carried out involving the collaboration of psychologists, teachers of Geography and other professional Geographers, and the British representative of the Commission was asked to organise a team to work on the particular problem of children's ability to read maps. A sub-committee was therefore formed consisting of the following members :-

Mr. T.W. Brown (Headmaster, King's School, Gloucester) - Chairman.

Miss R. Bowyer (University of Bristol, Department of Psychology).
Professor K.C. Edwards (University of Nottingham, Department of Geography), assisted by Miss D.M. Jeffrey (Derby Diocesan Training College).
Mr. E.O. Giffard (The London Geographical Institute).
Mr. R.C. Honeybone (University of London, Institute of Education).

The investigation was based on a series of tests carried out during the summer of 1959 in representative schools in different parts of England. Four Ordnance Survey maps on different scales and two atlases were selected and a series of questions covering Scale, Direction, Grid Reference, Conventional Signs and various forms of Interpretation were prepared, together with Appreciation of Relief by Contours. Initially a Pilot Study was undertaken in the Bristol area in which the questions were set to 60 individuals children and the results carefully analysed. As a result of this the questions were slightly modified and then used in the Main investigation covering representative schools in the London, Nottingham and Gloucester areas. It was found impracticable to give the full set of questions to all pupils owing to the limited time available and this Report, so far as the Main scheme is concerned, is therefore based on the results obtained from the shorter tests used in the Nottingham and Gloucester areas, supplemented by those from the full tests set in selected London schools. In all, nearly 1,000 pupils participated in the Main Scheme. In view of the comparatively small sample and the limited time available, it is not pretended that the results are conclusive but it is maintained that they are suggestive.

PILOT STUDY

1. The Problem. This concerned two kinds of task :

   (a) Questions relating to Measurement, Grid Reference and Direction

   (b) Questions relating to the understanding of contours and other symbols and simple Interpretation.

2. The Design of the Experiment

Four Ordnance Survey Maps on Scales of 1/2500, 1/10560, 1/25000, and 1/63,360; and two School Atlases (Philip's Pictorial Atlas and Philip's Modern School Atlas) were selected. Twelve questions as outlined in Appendix B were given to individual children; this was considered to be the maximum number which could be completed on an individual basis in interviews not lasting longer than an hour. Six of the questions involved scale reading, one for each map scale: the other six were classed as "composite" questions each involving one map characteristic - Relief, Direction, Conventional Signs, Interpretation, Settlement and Grid Reference. The final six questions were set on the 1/25,000 map, this being regarded as the one most likely to produce satisfactory results.

In all sixty children were interviewed, ranging in age from 8-15, and divided into two intelligence groups : (1) from 95-105 Stanford-Binet I.Q. ("Average"), (2) approximately 120 Stanford-Binet I.Q. ("Above average"). An equal number of boys and girls was included.

The Schools which co-operated were :-

Badminton School for Girls
Bristol Cathedral School
Colston Primary School
Connaught Road Secondary Boys' School
Connaught Road Secondary Girls' School
Cotham High School for Boys
Henbury Court Junior School
Knowle Juniour School
Novers Lane Junior School
Redland High School for Girls
La Retraite (High School for Girls)

Eleven schools were sampled in order to balance out environment differences.

String was provided for the scale questions, and where necessary assistance was given in locating the place referred to and the scale system was explained. Preliminary practice and explanation was given in direction and relief questions by four simplified diagrams. All spontaneous conversation was noted and at the end the children were asked their preference for type of question and map.

3. Quantitative Results

(a) Questions relating to Measurement, Grid Reference and Direction

(b) Questions relating to the understanding of contours and other symbols and simple Interpretation.

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3. Quantitative Results

(a) Scale Questions.

Errors for Boys - 16.	Errors for Girls - 15.
Errors of "Average" children - 12.	Errors of "above average" children - 19.

The above would appear to lead to the following conclusions :

(i) Neither sex showed a superiority of attainment.

(ii) Differences of age were more important than differences of intelligence, as long as this is not below average.

(b) Mixed Questions.

The following errors were recorded :

Relief	- 0
Direction	- 10½
Conventional signs	- 1
Interpretation	9½
Settlement	- 5
Grid Reference	- 13

The main errors in the Direction and Interpretation questions were made by the eight year olds, who could not even attempt the settlement question. The errors in Grid Reference were due to the comparative closeness of two farms and in general the children of eleven and above were less accurate than those of ten and below.

From a consideration of the quantitative results, the following conclusions may be drawn :

1. The most economical time to work at Scale Questions is at ages 12, 13 and 14.

2. In the Primary School there is no difficulty even at age 8 in understanding the use of contour lines to give appreciation about relative heights.

3. In the Primary School there is no difficulty even at age 8, in the using of conventional signs-

4. Interpretation and Settlement questions proved the two most difficult tasks in the given group of questions and are likely to be unsuitable for children under the age of 13.

5. Allowing for a simple explanation for the number of errors in the Grid question: e.g., the close proximity of two farms, it would seem that elementary grid work ought to be possible in a Primary School.

4. Qualitative Results.

At the youngest age arithmetic went wrong, even in counting the number of times the string was placed along the scale. Sometimes there was a notational reading problem, e.g., twenty-five thousand for 2500, and there was difficulty in knowing the intermediate parts of the scale, e.g., what to name the midway distance between one thousand and the next. The worst arithmetic difficulty was with the smaller scale maps.

There seem to be great individual differences in ability to deal with the direction questions, and the results have agreed with those of the Stanford-Binet Age Scale, viz., that before 15 years of age, the majority of children cannot easily cope with orientation questions.

There was a marked preference for the mixed questions, particularly amongst the older children, who said that they were more interesting than the scale questions.

M A I N S C H E M E

1. Method Employed in the Experiment.

This was divided into two groups :-

(a) The "Shorter Test": The six questions on Scale (one from each map) and the six composite questions from the 2½" map, which were used in the Pilot Study, were set to selected Schools in the Gloucester and Nottingham areas. The questions and accepted latitude of answers will be found in Appendix C.

(b) The "Full Test": composite questions on each of the maps were set to selected schools in the London area. The full questions and accepted latitude of answers will be found in Appendix D.

2. Schools participating in the Shorter Test.

(i) Nottingham Area

Grammar	Secondary	Primary
1. Ashbourne	1. Bramcote Hills	1. Middleton
2. Bramcote Hills	2. Glen-Bott	2. Roundhill
3. Carlton-le-Willows	3. Wilsthorpe	3. Henry Whipple
4. Ilkestone		
5. Long Eaton		

(ii) Gloucester Area.

Grammar	Sedondary	Primary
1. Crypt	1. Longlevens	1. Elmbridge Road
2. Denmark Road	2. Newent	2. Tredworth
3. Newent		

It is estimated that a sufficiently varied selection of schools has been made to eliminate differences in teaching and environment. The schools are representative of urban areas (including Housing Estates) and rural districts. The fact that more schools have been selected from urban or sub-urban areas than from rural areas represents the general pattern of school population in this highly urbanised country.

3. Schools participating in the Full Test

1. Bray's Grammar School, Harlow, Essex.
2. East Barnet Grammar School.
3. King's School, Gloucester.
4. Millfields Junior School, Clapton, E.5.

4. Method.

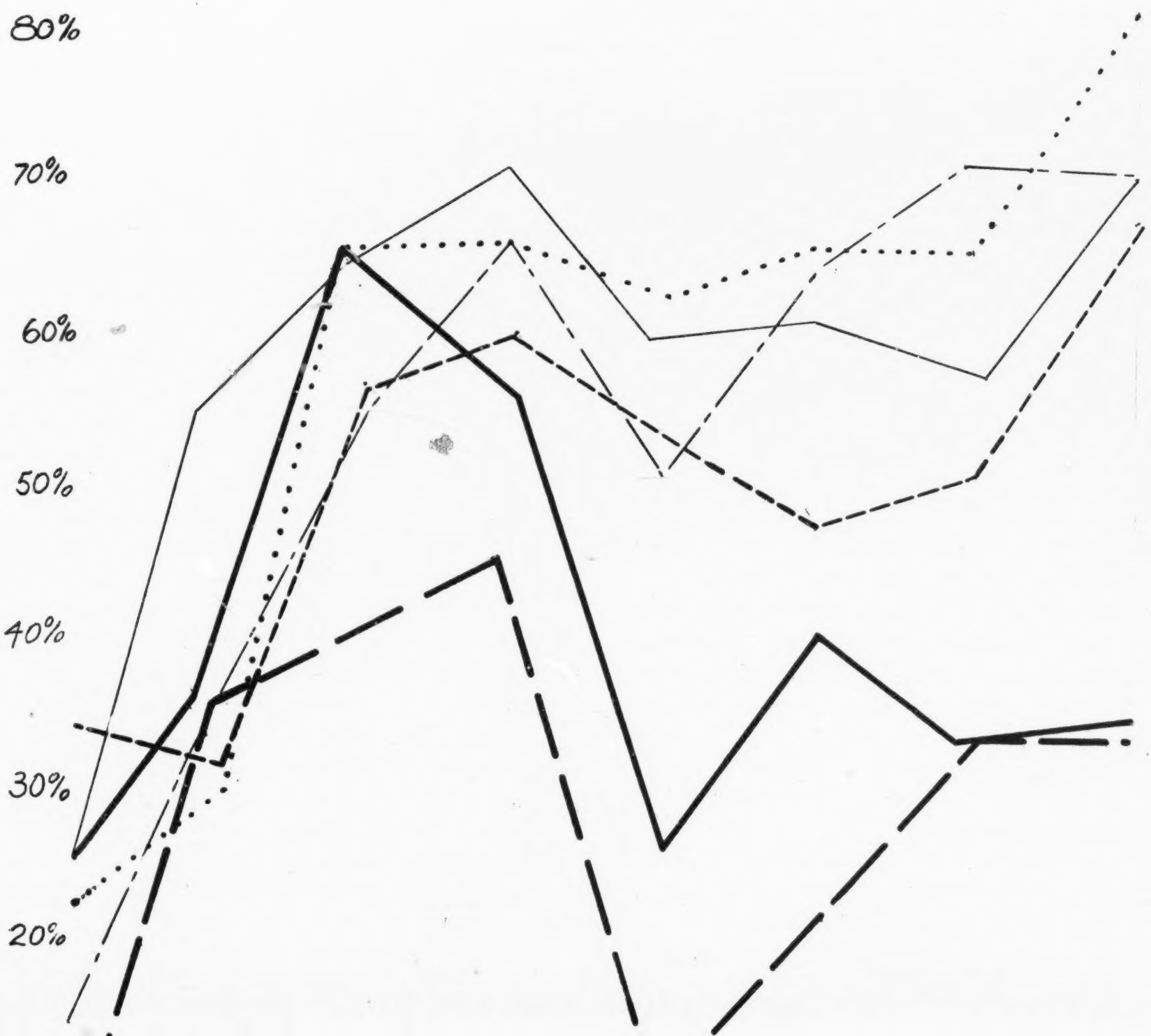
Both tests were worked in the schools by the children in normal classes. The teachers were informed that the test was intended to show capacity for understanding and not attainment of knowledge and were therefore encouraged to give such explanation and advice as was necessary. As the questions were set in most schools during a normal lesson period, the average time devoted to them was forty minutes, and necessarily some children may have been pressed for time.

FIG.1. SHORT TEST, SCALE QUESTIONS, A GROUP

The following graphs depict the average marks obtained by both boys and girls together expressed as a percentage.

25" 1 — - — -
6" 2 - - - - - -
2½" 3 . . . . . .
4 ——— 1"
5 ——— Pictorial Atlas
6 — — Modern School Atlas

Percentage
Marks
Gained



25" 1 — - — - —

6" 2 - - - - - -

2½" 3 . . . . . .

4 ——— 1"

5 ——— Pictorial Atlas

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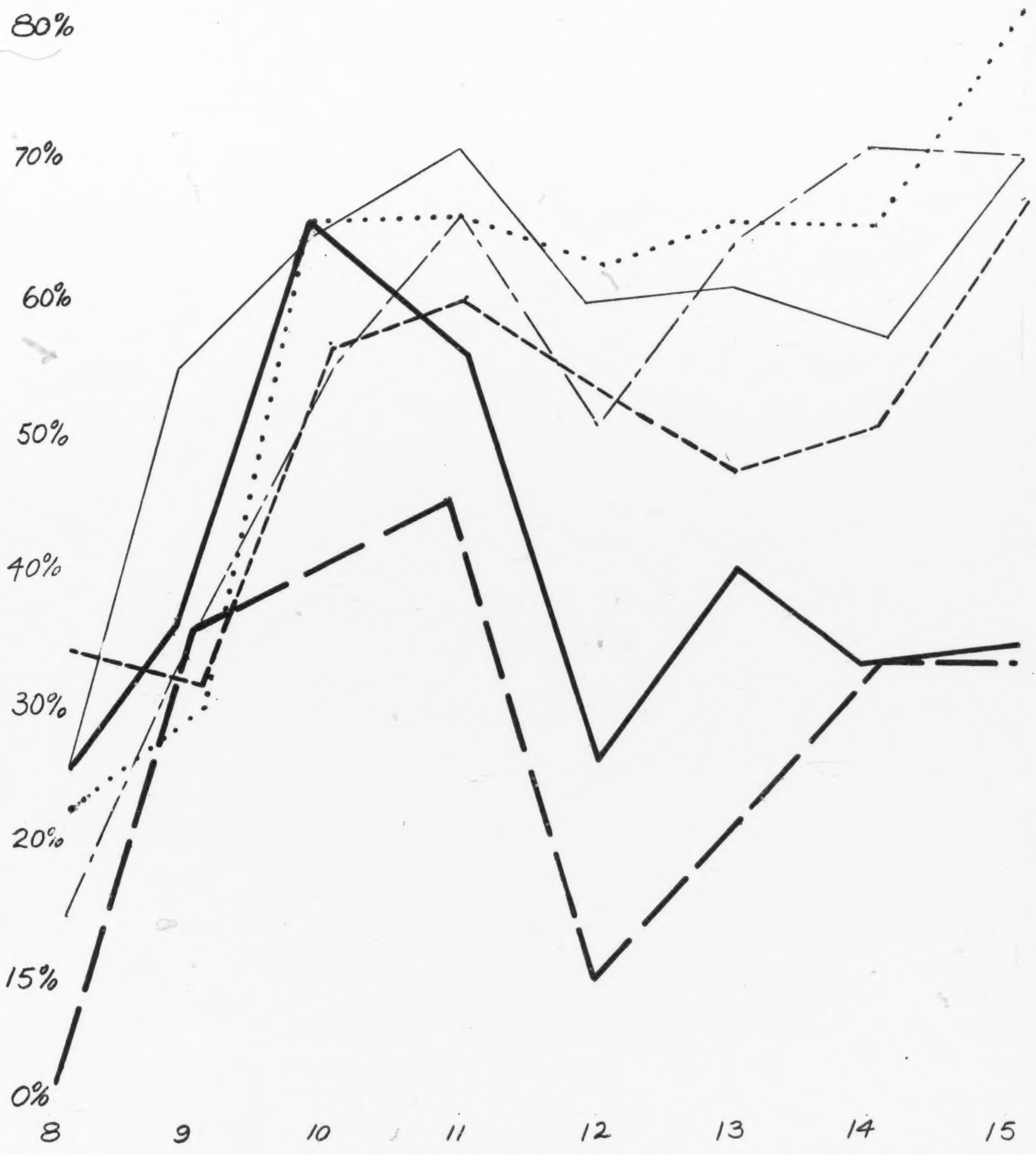
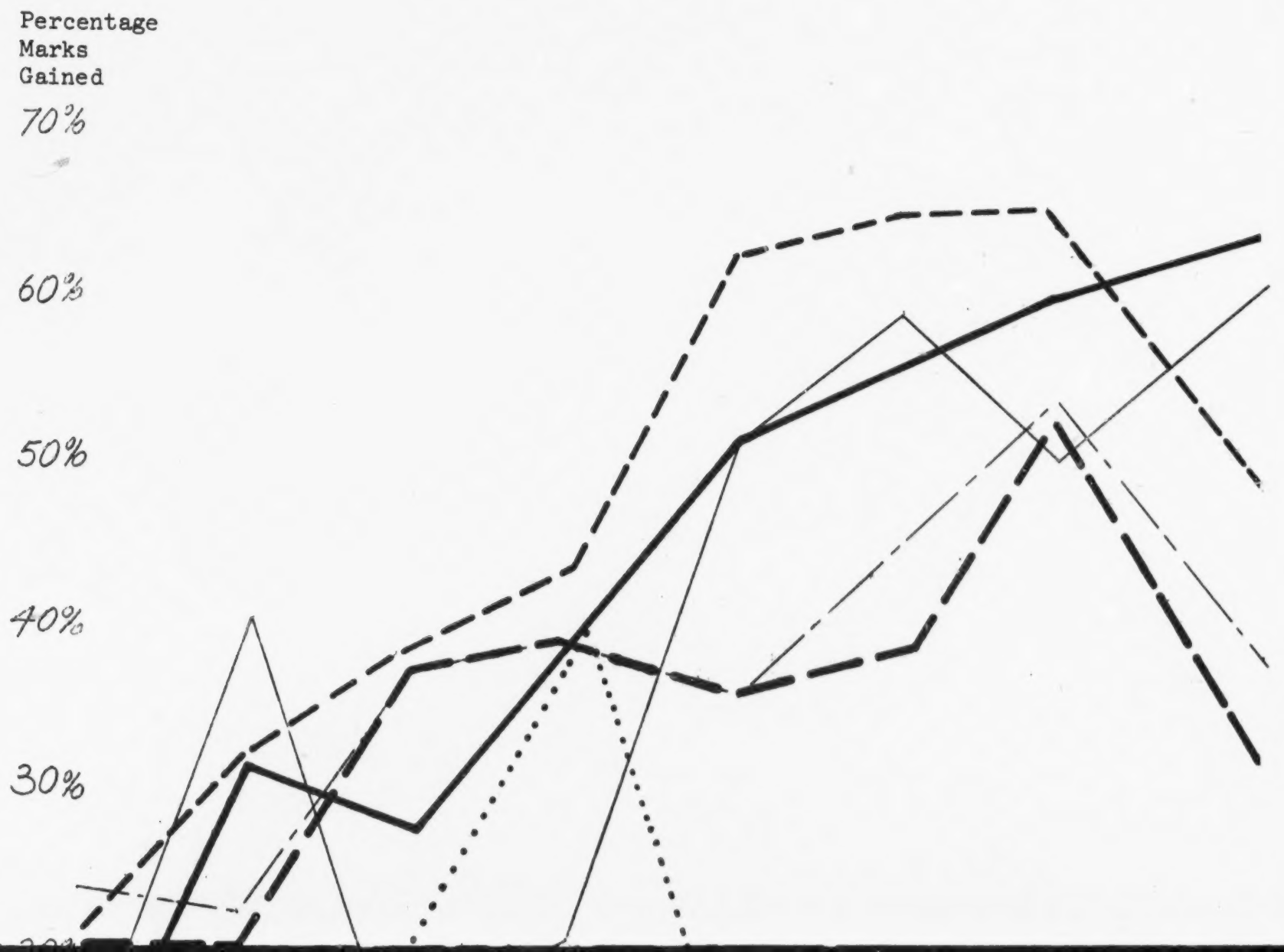


FIG.2 SHORT TEST. SCALE QUESTION. B GROUP

25" 1 .....
6" 2 —— - ——
2½" 3 ——————
4 1" ——————
5 Pictorial Atlas — — — —
6 Modern School Atlas .....



6" 2 ——— - ———
2½" 3 ━━━━━

5 Pictorial Atlas — — — —
6 Modern School Atlas .....

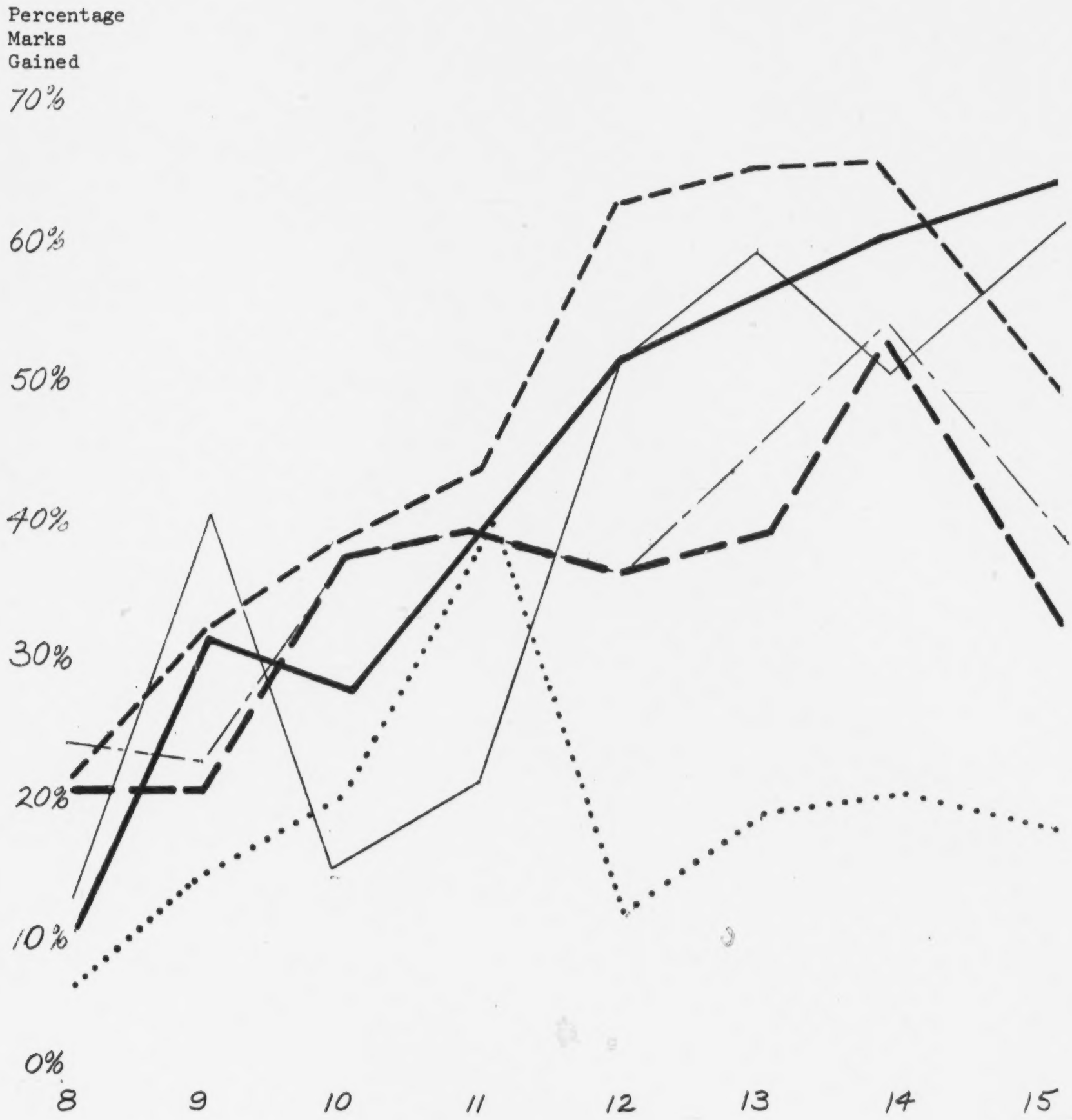


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FIG.3 SHORT TEST. COMPOSITE QUESTIONS. A GROUP

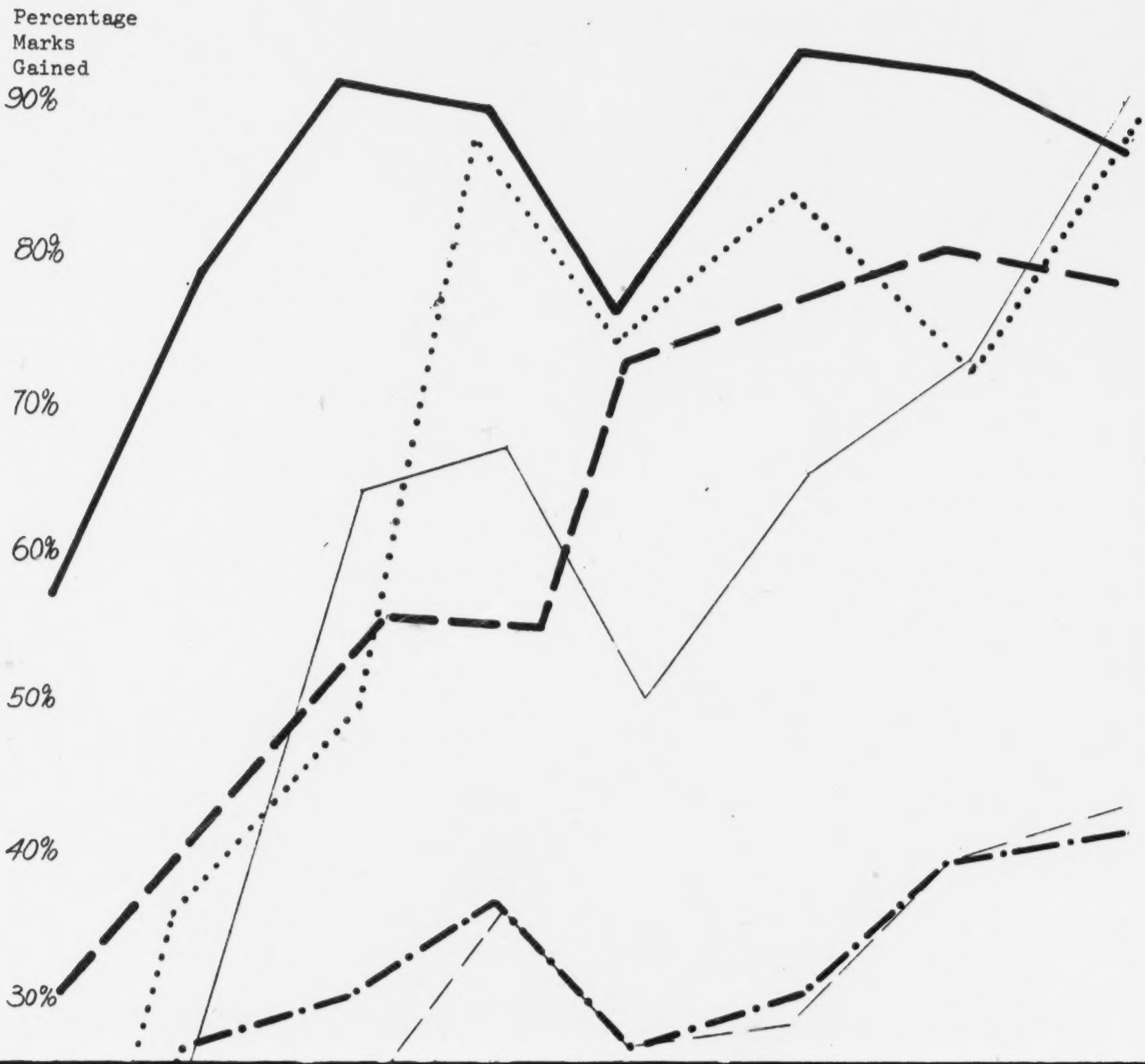


FIG.3 SHORT TEST. COMPOSITE QUESTIONS. A GROUP

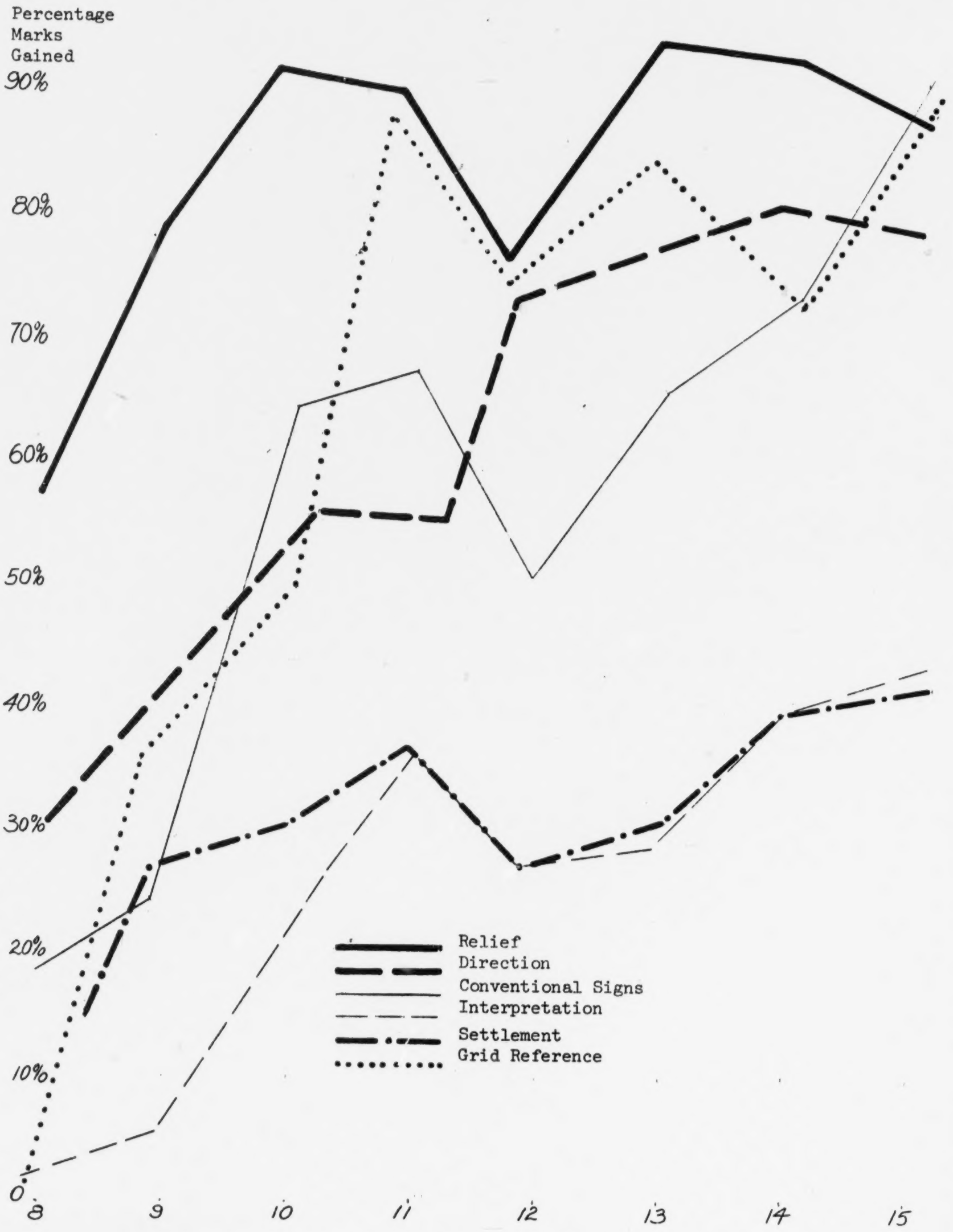
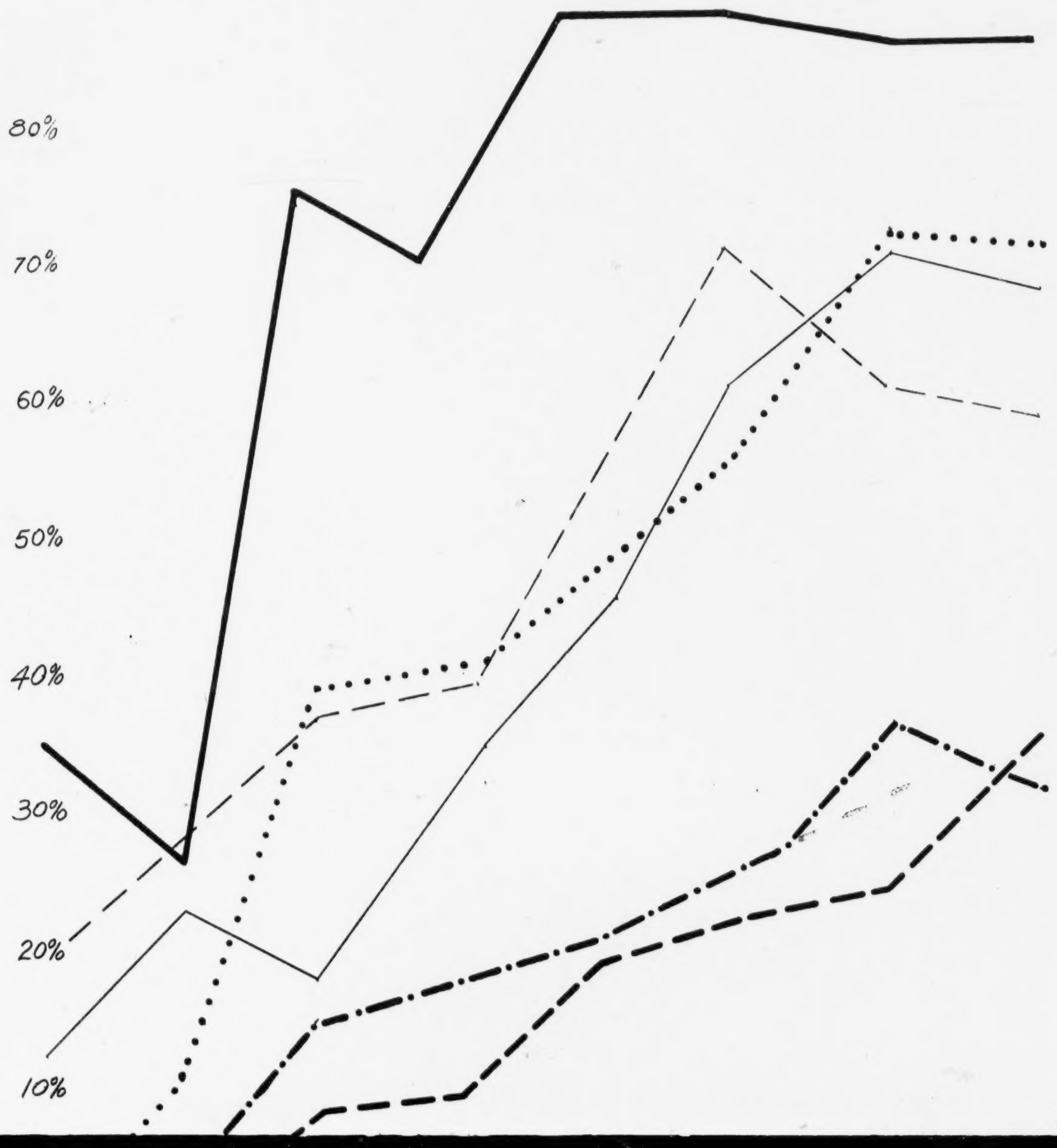
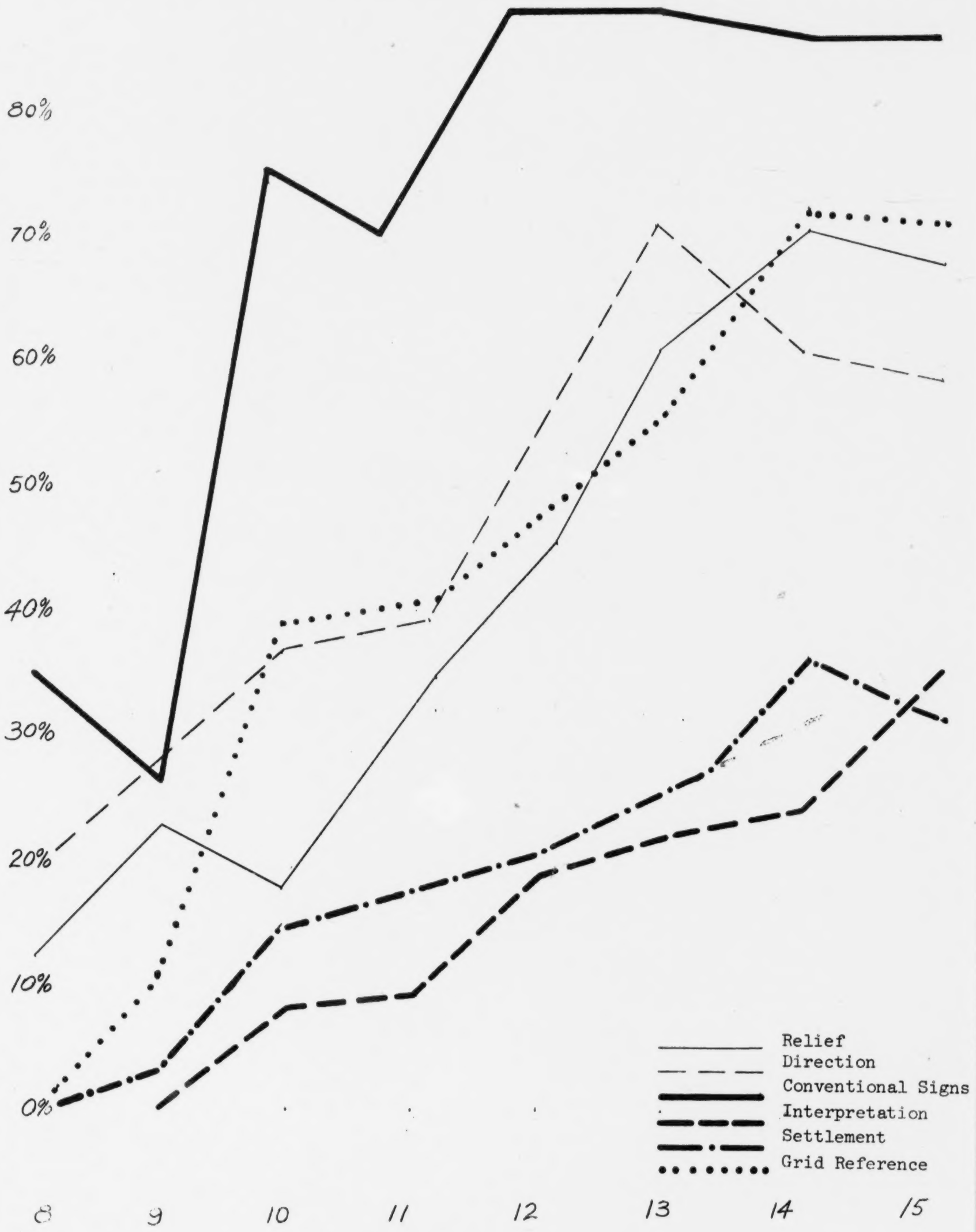


FIG.4 SHORT TEST. COMPOSITE QUESTIONS.




80%
70%
60%
50%
40%
30%
20%
10%
0%
8
9
10
11
12
13
14
15
Relief
Direction
Conventional Signs
Interpretation
Settlement
Grid Reference

AGE IN YEARS

FIG.5 A GROUP. FULL TEST

FIG.5 A GROUP. FULL TEST

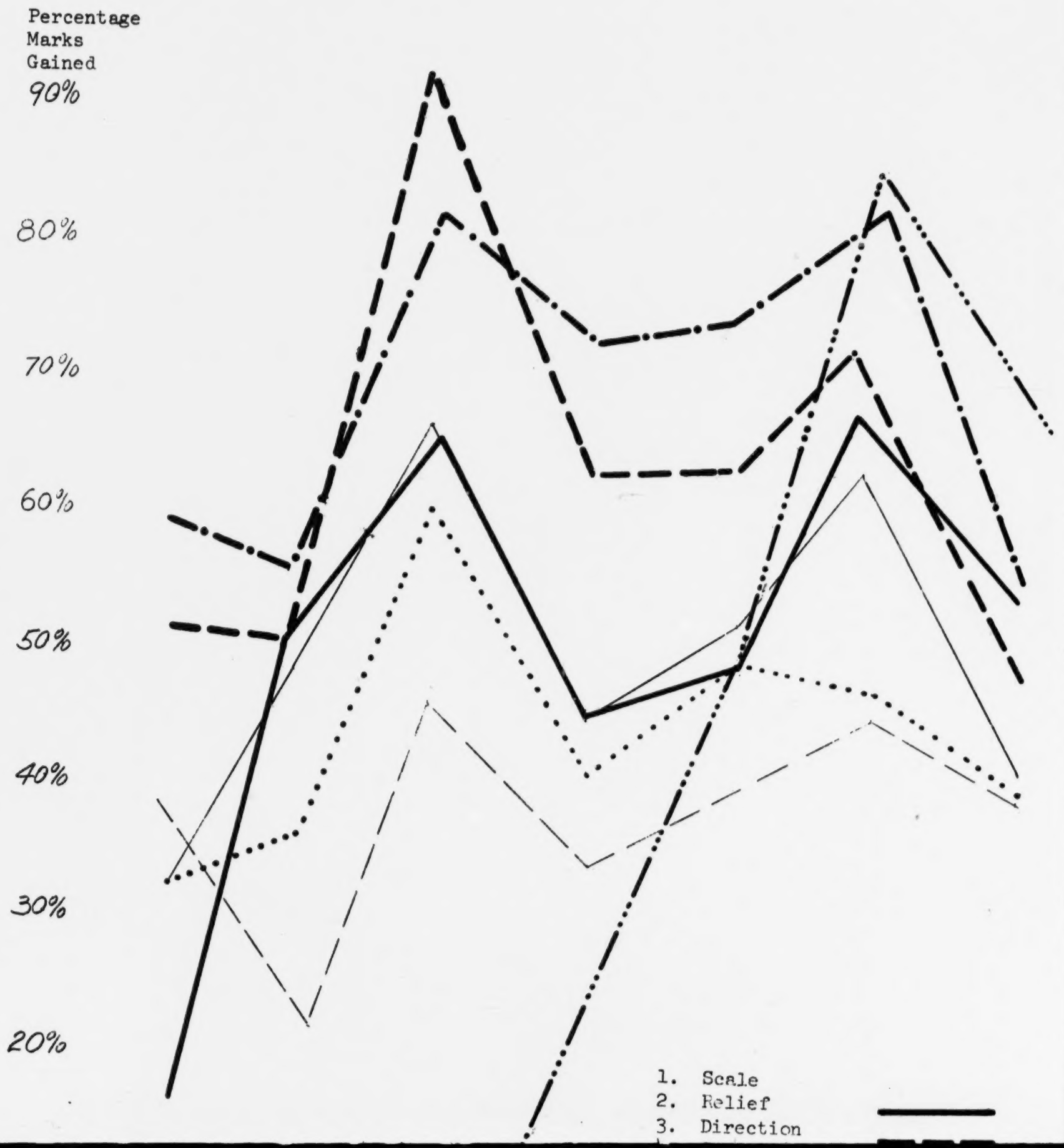


FIG.5 A GROUP. FULL TEST

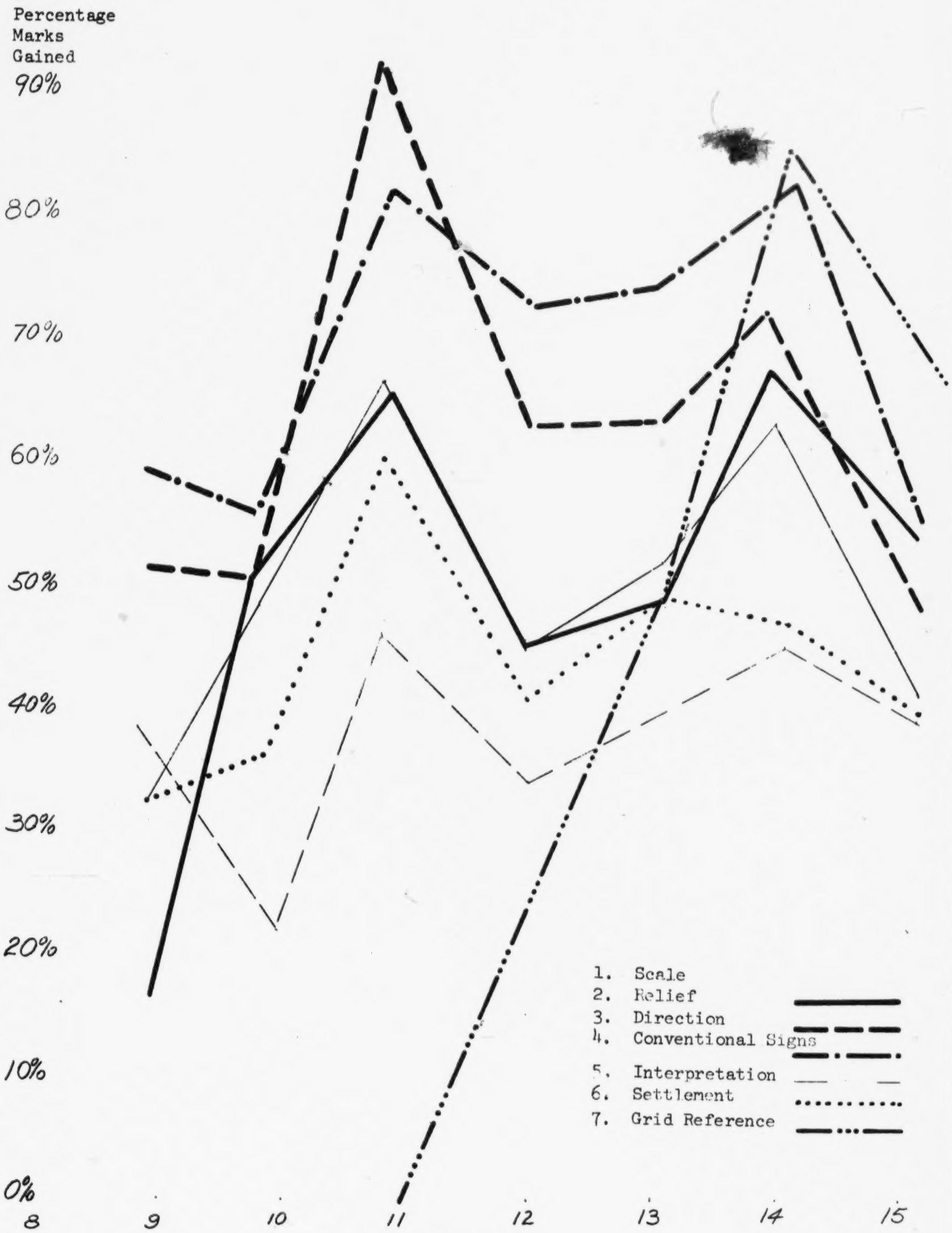
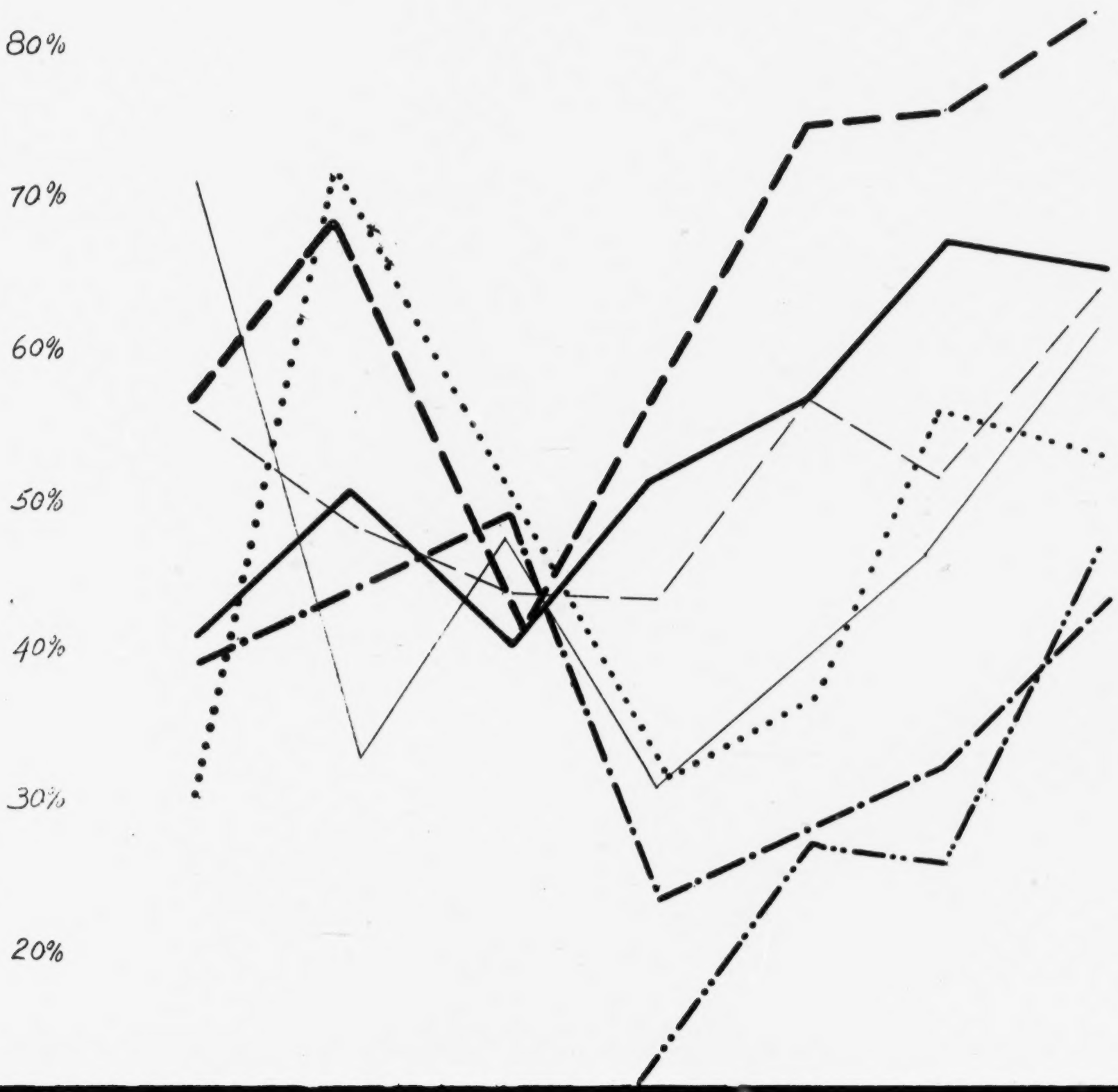
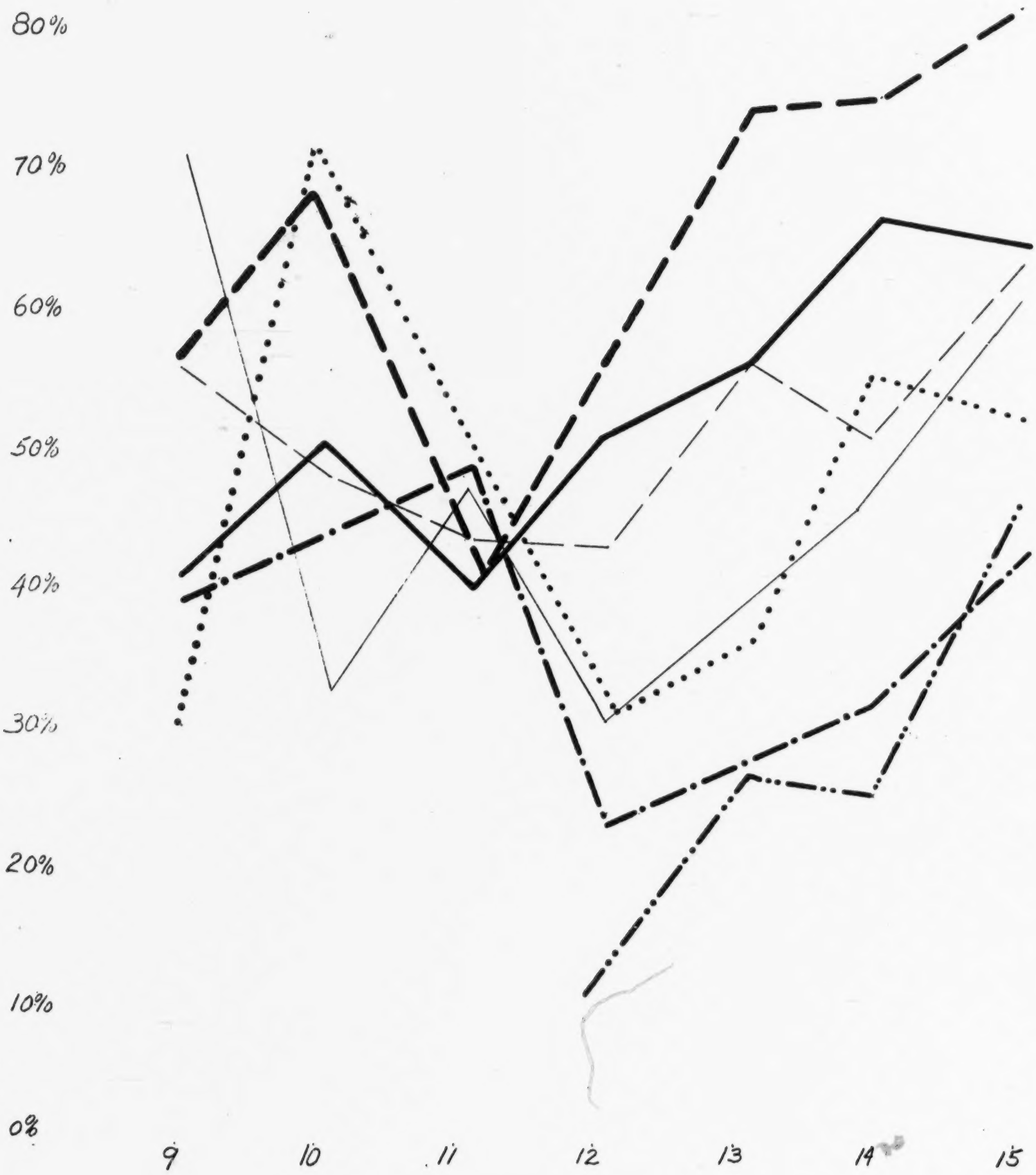


FIG.6 FULL TEST. B GROUP

1. Scale _____
2. Relief ___ ___ ___
3. Direction ━━━━━
4. Conventional Signs ━ ━ ━
5. Interpretation ━.━
6. Settlement .....
7. Grid Reference ━..━



3. Direction ——————
4. Conventional Signs — — —
7. Grid Reference —··—



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6. Generalised Indications.

(See Appendix "A" for Quantitative Results at each age tested).

1. The difference in attainment between the brighter and the less bright pupil is very marked below the age of 12, but tends to become considerably less, if not almost to disappear, between twelve and fourteen. In the case of the younger children this may in some measure be reflected by a difficulty in reading the question and by the slower rate of working of the less able younger child. The tendency to revert to this distinction at the age of 15 might in part be due to the earlier reaching of maturity by the brighter mind and it would have been interesting to discover which way the graph would swing for the age of 16.

2. The understanding of conventional signs is the simplest exercise of the map reader and well within the grasp of the eight year olds. As Miss Ethel David states: "The first attempts at the representation of Geographical facts in the form of a drawing are definitely pictorial" (Geography volume XXV 1940). Conventional signs are usually pictures in the most primitive form and it is therefore natural that children of this age should take happily to the representation of features by signs.

3. Direction questions present little more difficulty than the understanding of signs, and children are able to read the compass long before they have any idea about geometrical angles. "The relative position of objects comes before size - i.e., Direction comes before scale". (Ethel David, Geography volume XXV 1940). It is only in this topic of Direction that there is any major deviation between the findings of the Pilot Study and the Main Scheme. Generally speaking a smaller latitude of error was allowed in the Main Scheme than the Pilot Scheme. In this question however the same latitude was allowed which would prove to be to the advantage of the children in the Main Scheme. In other questions, the greater latitude allowed in the answers, together with the individual attention given, could well account for the higher level of successes gained in the Pilot Scheme.

4. The visualising of relief from contour lines is not such a difficult process for the young child as is sometimes supposed. The Training College Group of the Geographical Association has recorded in Geography volume XXVI 1941 an experiment in asking children to match pictures with maps; even at age 8 some 60% correct answers were given. In the current experiment several schools showed over 90% correct answers for the age of 10 and it is suggested that the brighter pupil might well be started off during the previous year with simple contour maps and diagrams.

5. Use of grid reference systems, and the teaching of the location of individual buildings and sites can well be accomplished at the time of the initial training in fractions or decimals about the age of nine or ten. Indeed it might be of valuable assistance in the understanding of the decimal system, as there is a need to divide the grid squares up into tenths in a child's imagination. The location of a point from a given figure reference has also the appeal of a game or "Treasure Hunt", and this is particularly suitable for

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6. The understanding of scale is a more difficult problem for the child than might at first be supposed, and is bound up with the attainment level reached in Arithmetic. It is doubtful whether this subject should be introduced much before the age of eleven when the optimum results were noted. This may in part be due to a child's training in accuracy at the end of the Primary School career in preparation for the Eleven Plus examination, or it may be due to a greater degree of patience at that age, before the mind is required to take in the wider aspects of learning as portrayed in the Secondary School. At age eleven, the measurement of scale will certainly prove a valuable adjunct to the Arithmetic lesson, and the child will be ready mathematically to tackle the more complex geographical problem afforded by scale.

6. 7. The interpretation of physical features and the discussion of settlement problems are by far the hardest task of the map reader. Both necessitate complex reasoning and cannot be taught by rule of thumb. They involve also a large measure of previous training in other aspects of map reading. It is doubtful therefore whether either can be usefully taught to children under the age of fourteen. If left until the other points have been successfully mastered, they can open up for the child a new vista in map work and a new field of discovery, and the danger of presenting too difficult problems before the child is ready to tackle them will be avoided.

8. The value of the large scale map in the teaching of geography as a whole, and in the teaching of young children in particular, is self evident. Children have generally expressed a preference for the Ordnance Survey Map over the atlas. In some cases this may be due to a sense of novelty, where the child had not seen a large scale map before. On the other hand, the large is more understandable than the small to the young mind, and the value of the large scale map in sample studies is unquestionable. It also introduces children to an area, which is within the limits of their understanding and appreciation. In this connection the 2½" map proved overwhelmingly popular, although it should not be forgotten that it was in most use in the Test. On the other hand some of the most accurate work and the best interpretation were accomplished on the "25". With greater familiarity, the successes might have been greater still. The one inch map was popular - again perhaps on account of its familiarity - but in most cases proved to complicated for accurate results to be achieved.

9. Much accurate work was done from the Pictorial Atlas, whereas indifferent results of scale measurement were obtained from the Modern School Atlas under the age of 13 (under 14 in the less bright group). This may be due to the fact that in this question in the case of the Modern School Atlas, the distance had to be measured over the margin of a double page, and most children did not take this into account. Nevertheless it leads to the supposition that the less complicated atlas is more valuable to the younger child, and more use might well be made of simplified atlases for young children. The idea of buying a child a "good" atlas which will last him throughout his school or even adult life is not sound geographical nor psychological reasoning. It may well be that a child will need three atlases during his school life, and under the age of fourteen these should be kept as simple as is compatible with the work being undertaken. Above fourteen a simplified map or atlas can obviously be of little value.

10. Age eleven seems to be an age of accuracy. Above that a falling off in efficiency is seen, which is often not made up again until the age of 15, (e.g.) in the London area the following figures are noted in the Direction question in the 2½" map :

Age	Girls	Boys
11	80%	83%
12	72%	75%
13	54%	63%

Similar figures can be recorded in almost all the topics which were tested. It is difficult to assess whether this is a feature

aspects of map reading. It is doubtful therefore whether either can be usefully taught to children under the age of fourteen. If left until the other points have been successfully mastered, they can open up for the child a new vista in map work and a new field of discovery, and the danger of presenting too difficult problems before the child is ready to tackle them will be avoided.

8. The value of the large scale map in the teaching of geography as a whole, and in the teaching of young children in particular, is self evident. Children have generally expressed a preference for the Ordnance Survey Map over the atlas. In some cases this may be due to a sense of novelty, where the child had not seen a large scale map before. On the other hand, the large is more understandable than the small to the young mind, and the value of the large scale map in sample studies is unquestionable. It also introduces children to an area, which is within the limits of their understanding and appreciation. In this connection the 2½" map proved overwhelmingly popular, although it should not be forgotten that it was in most use in the Test. On the other hand some of the most accurate work and the best interpretation were accomplished on the "25". With greater familiarity, the successes might have been greater still. The one inch map was popular - again perhaps on account of its familiarity - but in most cases proved to complicated for accurate results to be achieved.

9. Much accurate work was done from the Pictorial Atlas, whereas indifferent results of scale measurement were obtained from the Modern School Atlas under the age of 13 (under 14 in the less bright group). This may be due to the fact that in this question in the case of the Modern School Atlas, the distance had to be measured over the margin of a double page, and most children did not take this into account. Nevertheless it leads to the supposition that the less complicated atlas is more valuable to the younger child, and more use might well be made of simplified atlases for young children. The idea of buying a child a "good" atlas which will last him throughout his school or even adult life is not sound geographical nor psychological reasoning. It may well be that a child will need three atlases during his school life, and under the age of fourteen these should be kept as simple as is compatible with the work being undertaken. Above fourteen a simplified map or atlas can obviously be of little value.

10. Age eleven seems to be an age of accuracy. Above that a falling off in efficiency is seen, which is often not made up again until the age of 15, (e.g.) in the London area the following figures are noted in the Direction question in the 2½" map :

Age	Girls	Boys
11	80%	83%
12	72%	75%
13	54%	63%

Similar figures can be recorded in almost all the topics which were tested. It is difficult to assess whether this is a feature brought by accuracy of teaching at the end of a primary school career, or whether the subsequent falling off in efficiency is some inherent psychological trait in the make-up of the child, an "adolescent dip" so to speak.

11. There is some apparent superiority of boys over girls above the age of twelve. Differences as large as 14% have been noted for a similar age and ability group. This is in accordance with the conclusions of the Training College Group Committee (Geography volume XXVI 1941), but the graph smooths out at age 15 and it would be interesting to ascertain whether the equilibrium would have been

6. 11. (Cont'd)
restored again by the age of 16, as is suggested by the findings of that group. It would appear as though this might be a fruitfult field for further investigation. If the difference is great, not only in average results, but in the best and worst results then possibly there should be a separate selection of content or different methods of teaching.

12. Simple map reading, as distinct from the more complex processes of map interpretation, would appear from these results to be a task almost as easily and successfully accomplished from the age of 12 by the generally less able as the brighter children, but the Committee has found no evidence to indicate the reason. This is a question of absorbing interest and might well be the subject of further enquiry.

7. Acknowledgements.

(1) Pilot Scheme. The Sub-Committee wishes to express its thanks to Miss Linda Jenkins, Miss Margaret Newman and Mr. Peter Powesland for their help in connection with this investigation.

(2) Main Scheme. The Sub-Committee wishes to express its gratitude to the Directors of Education, the Headmasters, Headmistresses and Teachers of the schools which co-operated in the work of this enquiry; and to Messrs. George Philip and Son for the provision of atlases.

Appendix "A".

Detailed Quantitative Results at Each Age Tested.

Age Eight.

All children found it easiest to answer the question on conventional signs and children in the "A" group averaged more than 50% correct answers. In this question a marked superiority of boys over girls was noted, 65% of the boys in Group A having correct answers, against 47% girls. On the other hand, the sex superiority of boys over girls at this age was not noticed in other questions. In the "B" group 47% of the boys had correct answers against 25% of the girls. The superiority of the "A" group over the "B" group may in some respects be due to the fact that the former children will work faster and read the questions more easily at this age. 36% of the boys in the "A" group and 34% in the "B" group had the direction question correct. This success was not reflected in the girls where no correct answers at all were noted in the "B" group. The measurement of scale presented a good deal of difficulty, but it is interesting to note that the six inch map provided the most accurate results. Despite this however preferences were expressed for the 25" and the 2½" maps.

Age Nine

The difference between the "A" and "B" groups was rather more emphasized. This is a little surprising at an age when reading should come more easily to both groups. In the question on conventional signs, the boys in the "A" group attained more than 86% efficiency whereas the girls follow with 73%. The next easiest question was Direction, when the boys in the "A" group attained 52%, and the girls 33%. In the Scale question, the best results were obtained in the 25" map, together with the Pictorial Atlas, and in fact, the boys in Group "B" attained 58% in the 25" and the boys in Group "A" 68% in the Pictorial Atlas. This suggests that the age of scale comprehension is approaching. An overwhelming preference for the scale questions was noted, and the popularity of the 2½" map is beginning to appear, especially among the girls. The superiority of boys over girls is being marked, nearly as marked as the success of the "A" group over the "B" group. In all questions in Group "A" the boys answered 42% of the questions correctly against 31% of the girls. In Group "B" the figures are 25% against 17%. All these factors are borne out in the Long Test where Group "A" boys attained 81% in the direction questions and over 60% accuracy was obtained from all groups in the scale question in the Pictorial Atlas.

Age Ten

This would seem to be a suitable age to start teaching contours to a Group "A" child, where the average success was 65% and several schools had

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Age Ten

This would seem to be a suitable age to start teaching contours to a Group "A" child, where the average success was 65% and several schools had more than 90% correct answers. Boys showed a superiority over girls by 72% to 59% and this was particularly noticeable in category "B". The average was lower in this question than in the previous age group. The understanding of the grid system was clearly within the grasp of both the "A" and the "B" groups and the former attained an average of 54%. Scale questions too are now readily within the grasp of the "A" group and only the Modern School Atlas brought results of less than 50%. In the "B" group however, the averages were still low in this question. Boys continued to show a superiority over girls, and the "A" group over the "B" group. The large scale maps brought out the best results, although a preference was shown almost equally for the 2½" and the 1" maps. The preference for scale questions also continued, but to a smaller degree. Much difficulty was experienced in the use of the Modern School Atlas, although the Pictorial Atlas was used to good effect. Some results were obtained for the Interpretation and Settlement questions, which was particularly noticeable in the long Test, where percentages of over 80% were obtained in the Settlement question from the 25" map and the Pictorial Atlas. In the Full Test too over 70% was obtained in the Scale questions of the 2½" map by both boys and girls in the "A" group.

Age Eleven

At this age a high standard of accuracy in the Scale questions was achieved by the Group "A" children and later ages showed a decline until age 15 was reached. Only in the cases of the 1" map and the Modern School Atlas did this fall below 60%. There was little differentiation between boys and girls. The large scale maps and the Pictorial Atlas still produced the best results. For the group "B" children, however results in the scale questions were still low and in no case did the average reach 50%. The low average of 20% for the 25" map was caused mainly by the girls (three schools did not attempt the question and these results should therefore probably be disregarded). The average amongst the boys was 34% in this map and their overall average 43%. This is substantiated by the schools which have attempted the full questions where the average overall maps was 46%, and rose as high as 93% in the case of the Pictorial Atlas. It is probable therefore that this age is the one where scale can be most profitably taught. Questions on Relief too have brought good results, and an average of 67% was achieved in the "A" group. Location by Grid Reference presented little difficulty and the average in the "A" group was 88% in this question. Some children in group "A" were able to make an attempt at Interpretation, but this was not widespread. There is still a wide difference in achievement between the Group "A" and group "B" children; the former showed small preference in question selection, but the latter continued to opt for the scale question.

Age Twelve

The most remarkable feature in this age group was the falling off in accuracy of children in the "A" group which was rather more noticeable in girls than in boys. In few cases have actual marks obtained been as high as in the previous category. At age 11 the average percentage in the Scale questions on all maps was 60½%, at this age it has fallen to 42½%. This trend is equally noticeable in the other questions, where the average fell from 61½% to 54%. In the "B" group however there was a small rise from 37% to 41% in the Scale questions and in the other questions from 38½% to 47½%. This had the instant effect of closing the gap in attainment between the two groups and from this age until 15, the Group "B" children do nearly as well as the Group "A" children, whereas boys appear to do better than girls. For instance, the boys average percentage in all the scale questions was 48% against 38% for girls in the "A" group, and 45% against 37% in the "B" group. This is borne out equally by children taking the full Test. Whether this falling off in accuracy is due to the physical make up of the child, or in part due to the change over from the Primary to the Secondary education, with the wider range of subjects taught, is a matter of conjecture. At this age the average on all questions except Interpretation and Settlement is more than 40%, and these two questions, therefore, are the only ones to have presented real difficulty. The larger scale Ordance Maps continued to give the greater accuracy in Scale reading, but there seems to have been a big drop in this connection in the success of the 25" map. Only 18½% successes were recorded in the "A" group and 3% in the "B" group in the Full questions. Boys showed a preference for the scale questions, girls an outstanding preference for the composite questions. The popularity of the 2½" map remains dominant, although the 1" map comes into second place and was a particular favourite with the boys. This may have been due mainly to familiarity.

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Age Thirteen

The difference between Groups "A" and "B" now becomes very small and the overall average in the Short Test was 48½% in Group "A" compared with 47% in Group "B". In the Full Test the figures were 62% against 55%, which is a small margin of difference in comparison with previous ages. On the other hand, the gap is widening between boys and girls. In the scale questions in the "A" group, boys had an average of 54%, girls 47%, and in the "B" group boys 50% and girls 44%. This is the first time that an average of over 50% as seen in the Full Tests was achieved in the Settlement question and it is probable that the brighter children could be taught effectively the simpler elements of Settlement at this age. The 25" map and Pictorial Atlas gave the best results in this connection, but better results generally were recorded for the Modern School Atlas than in the previous age groups.

Age Fourteen.

The small difference in successful achievement between Groups "A" and "B" was again borne out: 65% against 60% average over all the questions. The large difference noted in the Full Test question of 66½% against 48% can be accounted for by the fact that no marks were obtained in the Grid Reference question by two schools in the "B" group, when clearly time was running short. On the other hand, the superiority of boys over girls continued; 56% against 42% in the "A" group in the scale question. This is further emphasized by the results in the Full Test. The Full Test also recorded very much more efficient results from the Modern School Atlas in the "A" group when the boys attained 73% and the girls 96%. It would appear that children at this age have reached the ability to read the more advanced type of Atlas and the girls in Group "A" achieved 70% success from the Interpretation question in the Modern School Atlas. This would seem to be the correct age at which to start in Interpretation at any rate for the brighter children. There was still an outstanding Preference for the 2½" map.

Age Fifteen

Group "A" pulled ahead again over Group "B" in attainment: 72½% against 61% in the average for all questions. This was equally marked in the scale questions and cannot therefore be due mainly to the greater proficiency of the "A" group in answering the two more difficult questions of interpretation and population distribution. It may well be due to the achievement of greater mental and physical stability at this age when adolescence is giving place to maturity. Nor is the superiority of boys over girls so marked: 68% against 63% over all the questions of the Shorter Test in the "A" group. The questions on Interpretation and Settlement still gave the lowest results and it may well be that some initial training would have made a good deal of difference in this field; best results in Interpretation were still obtained from the 25" and 6" maps. Difficulty was experienced in attaining accuracy in the scale question on the 1" map and in the Modern School Atlas. The Pictorial Atlas had lost its popularity and clearly was found to be too much simplified. Preference was overwhelmingly in favour of the 2½" map.

APPENDIX B

AVERAGE PERCENTAGES OBTAINED

SHORT TEST - SCALE QUESTION - A GROUP

	1	2	3	4	5	6
Age 8	15	33	21½	25½	25	1½
Age 9	32	29	28	37	54	32
Age 10	54	55½	65	65	64	39½
Age 11	66	60	66	57	69	45
Age 12	49	51	62	25	58	10
Age 13	63	43	65	38	59	24
Age 14	67	49	63½	32	55½	31½
Age 15	68	66	80	33	69	31

SHORT TEST - SCALE QUESTION - B GROUP

Age 8	13	24	11	20	20	7
Age 9	39	22	33	20	33	15
Age 10	16	37	28	37	40	19
Age 11	20	39	41	39	44	41
Age 12	49	36	49	36	64	11
Age 13	57	46	54	38½	67	20
Age 14	50	55	61	54	68	21
Age 15	60	39	63	32	47	18

1 - 25"
2 - 6"
3 - 2½"
4 - 1"
5 - Pictorial Atlas
6 - Modern School Atlas

AVERAGE PERCENTAGE IN EACH QUESTION

SHORT TEST - COMPOSITE QUESTIONS - A GROUP

	7	8	9	10	11	12
Age 8	17	28½	56	2½	1½	0
Age 9	25	40	78	6	28	37
Age 10	65	57	92½	25	31½	54
Age 11	67	57	91	39	39	88
Age 12	52	70½	74	28	28½	71½
Age 13	67	75	94	28½	27	83
Age 14	73	78	92	38	37	72
Age 15	91	77	88	44	47½	89

SHORT TEST - COMPOSITE QUESTIONS - B GROUP

Age 8	13	19	36	0	0	2
Age 9	24	27	27	2	5	11
Age 10	19	38	76½	10	15	40
Age 11	35	41	71	11	32	42
Age 12	47	57	89	21½	21½	49
Age 13	63	72½	89	26½	30½	57
Age 14	73	61	86	28	38	74
Age 15	70	58½	85½	41	37	73

7 - Relief
8 - Direction
9 - Conventional Signs
10 - Interpretation
11 - Settlement
12 - Grid Reference

AVERAGE PERCENTAGE IN EACH QUESTION

A GROUP FULL TEST

	1	2	3	4	5	6	7
Age 9	35	23	52	59	40	36	-
Age 10	49	51	51	55	25	41	0
Age 11	72	71	91	83	48	64	0
Age 12	44	44	63	70	32	40	26
Age 13	53	50	64	73	37	51	50
Age 14	65	69	72	82	46	48	84
Age 15	40	53	44	55	37	37	65

B GROUP FULL TEST

Age 9	70	55	41	56	40	31	-
Age 10	34	45	48	68	44	71	-
Age 11	46	42	39	39	47	48	-
Age 12	31	41	50	54	23	30	11
Age 13	38	54	54	70	27	35	26
Age 14	45	48	63	72	32	52	24
Age 15	58	61	62	78	44	49	46

1 - Scale
2 - Relief
3 - Direction
4 - Conventional Signs
5 - Interpretation
6 - Settlement
7 - Grid Reference

Direction	Symbols	Interpretation	Settlement	Grid Reference
In what direction would you be going if you walked along Spaniard's Rd. from Heath House to the edge of the Map?	State the meaning of any 4 symbols near the right hand side of Spaniard's Rd. between Heath House and the edge of the Map.	Give 3 different types of vegetation in the area between Spaniard's Rd. and North End Way, and suggest reasons why each occurs.	Name three areas where houses are clustered together.	Give the address of house at G.R. 26448617
In what direction would you be going if you walked along High St., Seal to Greatness?	State the meaning of any 4 symbols on the right hand side of High Street, Seal towards Greatness.	Most of the area shown on this map is farmland. Suggest why Rowdon Wood is not.	What similarity of pattern do you notice about the villages of Dunton Green and Otford?	Name the farm at G.R. 532585.
Ashwell lies in which direction from Baldock?	List three different types of buildings in the village. of Newnham.	Explain why there are several drainage ditches N.W. of Stotfold and none immediately to the S.E. of Baldock.	Give three reasons why you think the village of Ashwell was built where it is.	Name the farm at 248304.
In what approx. direction does Calne lie from Marlborough?	Name three different means of communication shown in Marlborough.	Suggest why there are so many Roman or earlier remains in the area a few miles N.W. of Marlborough.	What 2 similarities are there in the sites of the villages of Broad Town, Clyffe Pypard, Clevancy, Compton Bassett?	Name the farm at 056720.

Map	Scale	Relief	Direction	Symbols	Interpretation	Settlement	Gr Refer
25"	How far is it in feet from Bell Moor (26378625) along East Heath Rd. to the edge of the map?	Which is more level: Spaniards Road or North End Way from Heath House to the edge of the map?	In what direction would you be going if you walked along Spaniard's Rd. from Heath House to the edge of the Map?	State the meaning of any 4 symbols near the right hand side of Spaniard's Rd. between Heath House and the edge of the Map.	Give 3 different types of vegetation in the area between Spaniard's Rd. and North End Way, and suggest reasons why each occurs.	Name three areas where houses are clustered together.	Give t addres of hou at G.R 264486
6"	How far is it in Ft. along the OTFORD Loop of the Southern Rly from Otford A Junction to the edge of the map?	Does High St., Seal slope up or down towards Greatness?	In what direction would you be going if you walked along High St., Seal to Greatness?	State the meaning of any 4 symbols on the right hand side of High Street, Seal towards Greatness.	Most of the area shown on this map is farmland. Suggest why Rowdon Wood is not.	What similarity of pattern do you notice about the villages of Dunton Green and Otford?	Name t farm a G.R. 532585
2½"	How far is it in yards by rail from Letchworth Stn. to Baldock Station?	In which part of the map is the highest area of land situated?	Ashwell lies in which direction from Baldock?	List three different types of buildings in the village. of Newnham.	Explain why there are several drainage ditches N.W. of Stotfold and none immediately to the S.E. of Baldock.	Give three reasons why you think the village of Ashwell was built where it is.	Name t farm a 248304
1" Southern Half	How far is it in miles and fractions of a mile by road from the Q. at Quemerford near Calne to Marlborough College?	Describe changes in the level of the land you would notice in a direct journey from Wootton Bassett to Marlborough.	In what approx. direction does Calne lie from Marlborough?	Name three different means of communication shown in Marlborough.	Suggest why there are so many Roman or earlier remains in the area a few miles N.W. of Marlborough.	What 2 similarities are there in the sites of the villages of Broad Town, Clyffe Pypard, Clevancy, Compton Bassett?	Name t farm a 056720

Relief	Direction	Symbols	Interpretation	Settlement	Grid Reference
Describe 3 es in the of the land ould notice direct ey from ool to ield.	P.28. In what direction does Anglesey lie from Bristol?	P.29. (1) Which is bigger: Walsall or Leicester? (2) What connects Swindon and Reading?	Name 2 physical features about the Lake District (The High Area in Cumberland and Westmorland on p.31) and two about Lincolnshire (p.30).	P.28. What 2 parts of Wales are most heavily populated?	
3 different of relief mania.	P.41. Odessa lies in which direction from Warsaw?	P.41. What 3 types of communication are shown in Hungary?	P.40. Name 3 physical features of Austria which you can see from the map.	P.40. In Belgium name 2 areas which are very heavily populated and one area where few people live.	

Map	Scale	Relief	Direction	Symbols	Interpretation	Settlement	Gri Refer
Pictorial Atlas	P.25. How far is it in miles by aeroplane from London (W.Ham) to Cromer?	P.21. Describe 3 changes in the level of the land you would notice in a direct journey from Liverpool to Sheffield.	P.28. In what direction does Anglesey lie from Bristol?	P.29. (1) Which is bigger: Walsall or Leicester? (2) What connects Swindon and Reading?	Name 2 physical features about the Lake District (The High Area in Cumberland and Westmorland on p.31) and two about Lincolnshire (p.30).	P.28. What 2 parts of Wales are most heavily populated?	
Modern School Atlas	P.40. How far is it in miles by aeroplane from Berlin to Warsaw?	Name 3 different areas of relief in Rumania.	P.41. Odessa lies in which direction from Warsaw?	P.41. What 3 types of communication are shown in Hungary?	P.40. Name 3 physical features of Austria which you can see from the map.	P.40. In Belgium name 2 areas which are very heavily populated and one area where few people live.	

APPENDIX C

SHORT TEST

MAP	QUESTION	
25"	1. How far is it in feet from Bell Moor (26378625) along East Heath Road to the edge of the map?	
6"	2. How far is it in feet along the Otford Loop of the Southern Railway from Otford A. Junction to the edge of the map?	
2½"	3. How far is it in yards by rail from Letchworth Station to Baldock Station?	
1"	4. How far is it in miles and fractions of a mile by road from the Q at Queneford near Calne to Marlborough College?	
Pictorial Atlas	5. Page 25. How far is it in miles by aeroplane from London (W. Ham) to Cromer?	
Modern S School Atlas	6. Page 40. How far is it in miles by aeroplane from Berlin to Warsaw?	
2½"	7. In which part of the map is the highest area of land situated? Either say where it is or name the highest hill.	
2½"	8. Ashwell lies in which direction from Baldock?	
2½"	9. Name of three different types of buildings which you can see in the village of Newnham.	
2½"	10. Name two features of the landscape :- (a) N.W. of Stotfold	

-	Bell Moor (26378625) along East Heath Road to the edge of the map?	
6"	2. How far is it in feet along the Otford Loop of the Southern Railway from Otford A. Junction to the edge of the map?	
2½"	3. How far is it in yards by rail from Letchworth Station to Baldock Station?	
1"	4. How far is it in miles and fractions of a mile by road from the Q at Queneford near Calne to Marlborough College?	
Pictorial Atlas	5. Page 25. How far is it in miles by aeroplane from London (W. Ham) to Cromer?	
Modern S School Atlas	6. Page 40. How far is it in miles by aeroplane from Berlin to Warsaw?	
2½"	7. In which part of the map is the highest area of land situated? Either say where it is or name the highest hill.	
2½"	8. Ashwell lies in which direction from Baldock?	
2½"	9. Name of three different types of buildings which you can see in the village of Newnham.	
2½"	10. Name two features of the landscape :- (a) N.W. of Stotfold (b) S.E. of Baldock	
2½"	11. State two facts about the site of the village of Ashwell.	
2½"	12. Name the farm at Grid Reference 248304.	
	13. Did you prefer doing questions 1-6 or 7-12? 14. Which did you find easier Questions 1-6 or 7-12? 15. Which map did you like best?	

ANSWERS TO FULL QUESTIONS

25"	a.	Between 2170 and 2370 feet.	1 mark
	b.	Spaniard's Road	1 "
	c.	NE or NNE: 1 mark N:	½ "
	d.	4 symbols 1 mark 3 symbols:	½ "
	e.	3 types with reasons: 1 mark 2 types	½ "
	f.	3 areas and different types of settlement	1 "
		½ mark only if different types are not noticed.	
	g.	3 Holford Road Road	1 "
6"	a.	Between 7700 and 8500 feet	1 "
	b.	Downhill	1 "
	c.	West	1 "
	d.	4 symbols: 1 mark 3 symbols	½ "
	e.	Chalky or Sandy soil)	
		and hilly land) 1 mark: hilly only	½ "
	f.	1 similarity 1 mark	
	g.	Long lodge farm	1 "
2½"	a.	Between 3300 and 3700 yards	1 "
	b.	Either Hickman's Hill, Ashanger Hill, S.E.	
		Corner or bottom right hand corner	1 "
	c.	N.N.E: 1 mark; N. or N.E.	½ "
	d.	3 correct types: 1 mark, 2 correct types	½ "
	e.	2 correct features in each	1 "
		1 correct feature in each	½ "
	f.	2 correct facts: 1 mark; 1 correct fact	½ "
	g.	Lannock Farm	1 "
1"	a.	Between 10 3/4 and 11 3/4	1 "
	b.	½ mark each	
	c.	West	1 "
	d.	3 correct: 1 mark; 2 correct ½ mark	
	e.	1 mark if explanation not adequate	
		but a fair attempt.	
	f.	Spring line and Scarp foot: 1 mark, ½ mark for one only	
	g.	Nalands Farm.	1 "

Pictorial Atlas:

a.	Between 100 and 120 miles	1 mark
b.	Flat - Hill - Flat	1 "
c.	½ mark for noticing hill only	
	NW or NNW: 1 mark: N. ½ mark	
d.	Leicester ½ mark: Railway ½ mark	
e.	Lakes and mountains: ½ mark	
	Flat land and wolds ½ mark	
f.	½ mark each.	

Modern Atlas:

a.	Between 310 and 340 miles	1 mark
b.	1 mark for 3: ½ mark for 2	
c.	S.E. 1 mark: S. ½ mark	
d.	1 mark for 3: ½ mark for 2	
e.	1 mark for 3: ½ mark for 2	
f.	1 mark for 3: ½ mark for 2	

MARKING SYSTEM

(This allows an error of + or - 5%)

Question	1.	Between 2170 and 2370 feet.	1 mark
	2.	Between 7700 and 8500 feet.	1 mark
	3.	Between 3300 and 3700 yards.	1 mark
	4.	Between 10 3/4 and 11 3/4 miles.	1 mark
	5.	Between 100 and 120 miles.	1 mark
	6.	Between 310 and 340 miles.	1 mark
	7.	Either Hangman's Hill, Ashanger Hill, South-east corner or bottom right hand corner.	1 mark
	8.	N.N.E.	1 mark
		N. or N.E.	½ mark
	9.	3 correct types) Farm, Castle, Hall) Church, Post Office,	1 mark
		2 correct types) School, etc.	½ mark
	10.	2 correct features in each) a. Flat land) drainage) channels;) small fields,) etc.	1 mark
		1 correct feature in each) b. Hilly land,) woody, dry, etc.	½ mark
	11.	2 correct facts) spring line, sheltered) by hill, agriculture	1 mark
		1 correct fact) and fruit growing, etc.	½ mark
	12.	Lannock Farm.	1 mark